Secure Check pointing and recovery in Mobile Ad hoc Network

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***Abstract*: Routing in Ad hoc networks is the most researched scenario in recent years. Neighbor coverage calculation and rebroadcasting, in view of the probabilistic model, is utilized as a part of different methodologies and the benefits and negative marks of the situation are contrasted and compared with the existing approach. The most essential parameter is the protected and safe conveyance of packet bundles from source to goal or destination point. In the proposed approach a trust based Social Impact hypothesis is used which calculates the trust of the nodes in the system. The proposed approach is compared with its existing counterpart and results demonstrate the noteworthy change in results. In future other bio motivated and machine learning algorithms must be utilized for trust computation.**

Keywords:MANET, AODV, WSN.

I. Introduction

Rebroadcasting of information in Mobile Ad-hoc Network is an imperative issue of worry in the last recent years. Different neighbor coverage procedures have been put forward and probabilistic situations have been processed keeping in mind the end goal to take the choices of rebroadcasting of information. MANET is a sort of remote system which for the most part has a routable networking condition on top of a link layer ad hoc network. Mobile ad-hoc network comprise of self shaping, peer to peer network and this network is one of those networks in which it can change its location and configure itself on the fly. This is because of the reason that the MANET systems are the versatile systems which utilizes remote association to interface with a few systems [1]. It might be standard Wi-Fi association like cell correspondence, satellite transmission. Additionally some portable systems are constrained to local area networks of wireless devices while some are associated with web. For instance, VANET is one of the types of MANET networking systems which licenses vehicles to impart information with roadside equipment. As we realize that the vehicle does not have direct coordination with internet connection, then the roadside equipment allocates the wireless connection which allows information from the vehicles to be sent over web. The information of vehicle can be used to gauge the traffic conditions. MANETs are for the most part not secure because of its dynamical nature, in this manner it is essential to be cautious of what information is sent over MANET [2]. In the proposed work social status of a node is ascertained utilizing the different execution parameters like packet delivery proportion, residual energy [3]. Trust of a node is computed utilizing the social impact theory optimizer algorithm which is based on the preceding interactions of the node. The information is exchanged to the neighbors for further transfer of data to the destination.

In general, the routing protocols of MANETs can be partitioned into two classes: table-driven proactive routing protocols and on-demand reactive routing protocols. In table-driven routing protocols, such as OLSR and DSDV, every node ceaselessly administers the complete routing information of a network. When a node needs to forward a packet, a route is made promptly accessible. In on-demand routing protocols, such as DSR and AODV, mobile nodes sustain path information for destinations only when they require to contact the source node or relay packets. Wireless Networks evolved through numerous generations initiating from simple sensors deployed in fields to military applications to perilous industrial applications. Presently, the sensor systems application is arranged into chiefly three fields in view of the applications i.e. in WSN, in energy consumption which is a major issue and in MANET's, mobility of nodes is considered as the major challenge for a variety of portable applications. Furthermore, in VANET's, essential challenge is to lessen the traffic consideration [4]. Current Wireless sensing networks can be positioned underwater and underground. Depending upon the atmospheric conditions, sensing network faces distinctive challenges and constraints. Wireless sensor network can be classified as: submerged WSN, terrestrial WSN, and multi-media WSN, underground and mobile WSN. Terrestrial WSNs are those that usually incorporate heaps of wireless sensing nodes settled in the given space, either pre-arranged or in ad hoc manner [5]. In unpredicted placement, sensing nodes can be bed roped from plane and particularly placed into the topographic point. In pre-arranged placement, there are optimal location, grid readying, and 2-d and 3-D placement models. In exceedingly terrestrial Wireless sensing networks, dependable correspondence in associate atmosphere is critical. Terrestrial sensing nodes may now be ready to communicate back to base station. Terrestrial sensing nodes having secondary battery for power supply as primary source of battery can be prohibited and reversible. In wireless sensor networks, there are numerous approaches which can facilitate to accumulate energy. Some approaches are multi-hop fastened routing, network knowledge aggregation, eliminating knowledge redundancy and minimizing delays. Underground Wireless sensing networks involve the range of sensing nodes obscured in deep fissures cave or want to monitor underground environment [7]. Figure 1.2 shows the classification of several problems in WSN. Furthermore sink nodes can be positioned inside the ground to transmit knowledge from sensing nodes to base station. These sensing nodes are exclusive result of adequate mechanism components and are opted to make sure of the consistent communication via soil, water, rocks, and alternative mineral contents.

The atmosphere makes a challenge in the wireless communication for the reason of signal losses and high levels of the attenuation. Underwater Wireless sensing networks involve the range of vehicles and sensing nodes placed underwater [8].In comparisons with terrestrial WSNs, these sensing nodes are expensive. The self-directed submerged vehicle has been utilized for the investigation or compilation of knowledge from sensing nodes. Sensing nodes are positioned beneath water in terrestrial WSN. A distinctive submerged wireless communication can be established through broadcasting auditory waves. A challenge in submerged acoustic communication is the constrained information measure, extended propagation delay and signal weakening issue. Multi-media Wireless detecting systems are empowered to see and track proceedings in the diversity of mixed media framework like video, audio and imaging. Multi-media Wireless sensing networks incorporates sensing nodes which is inbuilt in voice amplifiers and cameras. These sensing nodes will be interconnected with one another in the network. In order to acquire coverage, these nodes are positioned in an intended manner. The significant difficulties in WSN are high energy utilization, superiority of the service provisioning and compression techniques, processing and cross-layer style. Multi-media content such as video stream requires high information measure for the content to be delivered [9]. Within conclusion, high rate is the foundation of high energy consumption. Transmission technique can maintain low energy utilization and high information measure to be developed. Portable Wireless detecting systems can be involved in sensing nodes which proceed onward their own and connect with the physical atmosphere. Mobile nodes can power sense, communicate and cipher like static nodes. The most distinctive attribute is that mobile node has the potential to organize and relocate itself within the network. A portable Wireless detecting network containing sensors will pop out with thefew primary placements and nodes that are displayed to accumulate information. Information accumulated by the mobile node could also be transmitted to the alternative mobile node where they are varied of every substitute. The distinction can be knowledge distribution. In mobile WSN, information has been separated in to three dynamic routing. Mobile WSN faces various issues like deployment, localization, navigation, self-organization and coverage, organization, preservation, and energy

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II. Related Work

Kothandam et al. [2013] proposed the NCPR along with modified ZRP. This protocol has been presented to enhance the performance transfer the message from source to target. The neighbor coverage knowledge compared to NCPR. The simulation results indicate that the Probabilistic Rebroadcast has good rebroadcast delay may listen to RREQ packets from the performance when the network is in high density.

Ravi et al. [2015] presented neighbour coverage based probabilistic rebroadcast protocol which helps to minimize the routing overhead in MANET. Here retransmission delay is used to evaluate the retransmission order. Thus, it’s getting precise coverage ratio by sensing coverage and connectivity factor. The proposed NCP protocol is used to analyze these two parameters and this parameter helps to avoiding the irrelevant data.

Shobha et al. [2015]presented a distributive and systematic algorithm. This proposed approach help to deal with flooding mechanism in routing. To minimize the routing overhead request, probability mechanism is developed. If there will be requirement of maximum bandwidth and minimum delay is available then a route is chosen for transmitting data for an application. The proposed algorithm is to take quality of service support to AODV protocol in the form of reduced control overhead. The simulation result is done by using NS-2 tool. The performance of the proposed approach indicates that it is very efficient and provides high performance.

Dinakar et al. [2015] The main focus of the paper deals with reducing overheads for which a hexagonal based clustering is proposed for avoiding frequent route discoveries and thus maximizing the lifetime of the networks. Eventually it provides additional coverage area and so it reduces end--end delays.

Anastasi. G et al. [2005] proposed a transport protocol for Ad-hoc networks (TPA) to tailor the characteristics of the mobile ad-hoc network environments. They completely redesigned the congestion control mechanism which is also based on window but in TPA the maximum congestion window size is very small and the maximum, minimum values are very close to each other. TPA protocol is able to conserve energy by avoiding many useless transmissions. To validate TPA, they assume the same physical channel model used in the ns-2 simulator. Simulations have compared performance of TPA and TCP in a static scenario. The results have shown that TPA outperforms TCP in all operating conditions.

Adarbahet al. [2015] in this paper, effect of channel noise and thermal noise effect has been discovered which is employed in discovery mechanism in ad-hoc network. Depending on the simulation of NS2 tool, this paper investigates the comparison with the previous work. It can be found that proposed method will not outperforms flooding strategy when thermal noise and co-channel interference are taken into account.

Atif et al. [2016] presented a novel hybrid strategy which merges distinct approach which can combine to minimize the overhead and save energy. In this paper, adaptive forwarding strategy which uses the data of 1-hop neighbouring radios. In this strategy nodes does not requires a positioning system to find their location. Moreover the proposed work divides the network in to some groups which is relied on the transmission power level. Hence the node which receives the message from separate groups is taken as gateway nodes. This gateway node helps in forwarding RREQ packets and also unessential re broadcast is avoided. The performance analysis o the proposed approach indicates a reduction in overhead and in consumption of energy.

Shanmugamet al. [2016] the proposed schemes open a novel approach for probabilistic based broadcasting approach for route discovery known as dynamic probabilistic based routing (DPR). In DPR, the packets are forwarded to the neighbour node with dynamically computed probability called as forwarding probability (FP). The probability function is calculated based on the density of the local neighbours and cumulative amount of neighbour mobile nodes. Hence, it is vital to identify the dense and sparse regions. The performance of the various routing protocols has been compared using various qualities of service parameters of MANET, namely, overhead, average collision rate, end-to-end delay, and network throughput.

Brahmankar et al. [2015]in this paper, a detailed review is taken to reduce the routing overhead in ad-hoc network. The techniques given here may be utilized to enhance the performance of routing. They have their own advantages or disadvantages. Because of less redundant rebroadcast, the NCPR protocol moderates the network collision and contention, which increases the packet delivery ratio and decreases the average end-to-end delay.

Kaur et al. [2015] in this paper Dynamic Node Recovery approach has been presented. This approach is employed genetic algorithmic operations to ensure optimal recovery of node failures. Refinement of some of the aspects of the existing base approach reduces the recovery time considerably, thereby, improving the throughput of the network. It also enhances the network lifetime as the proposed approach leads to lower energy level drops in the nodes.

III. PROPOSED METHODLOGY

Objective Function

In the proposed approach an objective fitness function is used which utilizes the value of various parameters for data transfer. The given factors are:

Distance between the nodes:

The distance between the nodes is an important parameter which is used to calculate the distance between the two nodes in the network. The distance between the nodes is calculated using:

$$Distance = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} \quad (1)$$

Residual Energy of a Node:

Residual energy is defined as the remaining energy at the node during and after communication. It is calculated as:

$$Residual\ Energy = Total\ Energy - Energy\ Used$$

Queue Length:

Queue Length of the node is defined as the maximum number of packets a node can store during communication.

Number of Retransmissions:

Number of retransmissions is defined as the number of times a node needs to retransmit the data after being lost in the network. It is a negative parameter which must be reduced.

With the help of these parameters an objective function is defined and the value of objective function is calculated which is supplied to the opinion of the trust based algorithm. The objective function is given by:

$$FitnessFunction = \sum(w_1 d_{i,j} + w_2 R_e + w_3 Q_l + w_4 R_t) \quad (2)$$

where,

w_1, w_2, w_3, w_4 are the weights,

$d_{i,j}$ is the distance,

R_e is the residual energy,

Q_l is the queue length and

R_t is the number of retransmissions

The above calculated fitness value is then used as the opinion and distance and initial trust value is used for calculation of the social rank of the node.

$$SR = T/d_{i,j} \quad (3)$$

And delta function is calculated using the social rank value and the opinions of a node

$$\delta = \frac{o_{i,j}}{SR} \quad (4)$$

ALGORITHM

1. Start
2. Initialization of node location and trust
3. Path $\leftarrow$Calculate route (n_s, n_d) n_s is source node and n_d is the destination node.
4. For I in 0 to n.
5. If ($(n \in Path)$
6. Update count, updation of number of interactions of a node in a path
7. end if
8. end for
9. For $i \; in \, 0 \; to \; n$
10. For $j \; in \, 0 \, to \; n$
11. $D \leftarrow CalcDist(n_i, n_j)$, distance calculation for social rank.
12. $O_j \leftarrow CalcObj(n_j)$, objective function
13. $SR \leftarrow \frac{O_j}{D_{ij}}$
14. $trust \leftarrow \frac{SR}{Hop\,Count}$
15. End for
16. End for
17. End.

IV. RESULTS

Figure 1 shows the node deployment in the network. The nodes are deployed in the network randomly and are placed within the size of the grid. Figure 2 shows the communication between the nodes in the network and in figure 3 depicts the packets drop in the network as shown.

Fig 1 Node Placement in the Network

As shown in figure 1, the network is deployed with finite number of sensor nodes. The deployed network has fifty sensor nodes. These nodes pass the information to each other as and when they come in the radio range of each other. They detect the presence of the node in its range and starts sensing and transmitting message.

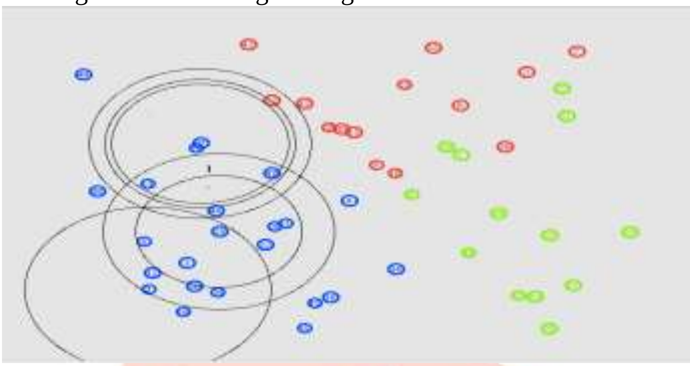

Fig 2 Communication between Nodes

As shown in figure 2, all the nodes start communicating and sensing each other. Nodes transfer the data packets from one node to other node as and when they come in the radio range of each other they become active for sharing and sensing. During data transfer, some data packets may get lost due to limited energy of nodes; and due to this some of the receiving nodes may not sense and get the data packets.

Fig 3 Packets Lost in the Network

As shown in figure 3, Limited energy restricts the communication and the message between carrier nodes. Due to limited energy and non-persistent storage the messages drop out of buffer and are lost. Some nodes fail to receive message because of limited energy to communicate and carry along in their buffer space.

Average Energy Consumed

The total energy consumed in the network while transmitting the data packet or while idle listening, protocol overhead and overhearing. Figure 4 shows the graph of average energy consumed for the proposed and the basic approach.

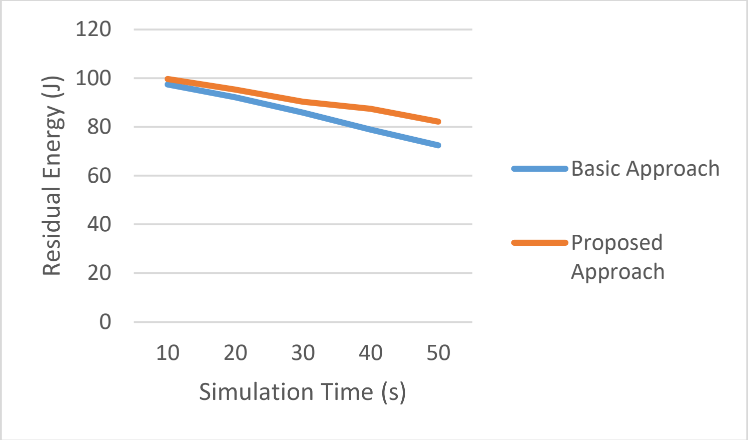

Fig 4 Average Energy Consumed

The average energy consumed by the network decreases as the number of packet retransmissions in the network decreases. The number of retransmissions is related to the number of times a packet needs to be retransferred.

Packet Delivery Delay

It is defined as difference between the time packet is generated by the sender and the time packet is received by receiver. It includes all the transmission, propagation, queuing and processing at individual sensor nodes delay. Figure 5 shows the comparison of the packet delivery delay between the basic and proposed approach.

Packet delivery delay is directly related to the packets lost in the network. As defined above that the number of packets lost in the network decreases as the route is through the trusted nodes. So the packets need not to be retransmitted and the loss in the network decreases, hence decrease in the packet delivery delay.

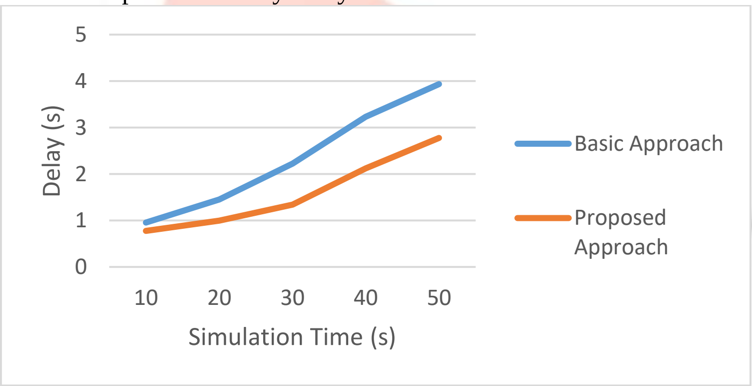

Fig 5 Packet Delivery delay

Average Packet Delivery Ratio: It is defined as follows:

$$Packet\ delivery\ ratio = \frac{total\ packets\ received}{total\ packets\ generated} \quad (5)$$

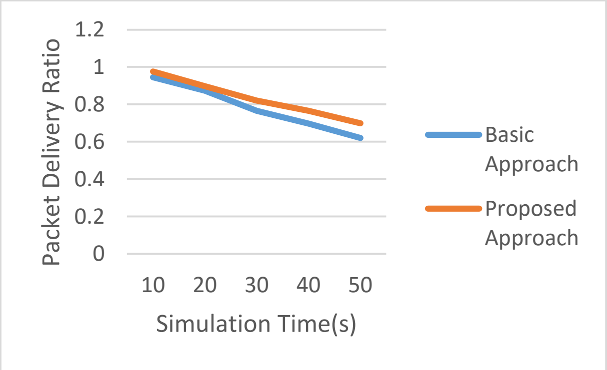

Fig 6 Average Packet Delivery Ratio

Figure 6 shows the packet delivery ratio comparison between the basic and the proposed approach. The packet delivery ratio for the proposed approach is better compared to the basic approach because the packet lost in the network reduces.

V. CONCLUSION

Neighbor choice and rebroadcasting of data is an imperative part of research lately. A likelihood based approach is proposed in the current work which computes the estimation of the probability and node is selected on the basis of the probability value. In the proposed approach a trust based probabilistic model is characterized which ascertains the estimation of the target work in view of different parameters and a trust based calculation is utilized. The supposed estimation of the trust based algorithm is a combination of residual energy and other parameters. The proposed approach is then compared with the basic probabilistic approach and the result shows an improvement in residual energy, packet delivery delay and packet delivery ratio.

In future other machine learning calculations must be utilized to compute the trust esteem and to additionally enhance the packet conveyance proportion in the system.

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